STOP AKI in Malawi

London Acute Kidney Injury Network

Dose, Timing and Withdrawal of RRT in AKI

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Barts Health NHS Trust

RRT in Critically Ill Patients

Prescribing RRT in critically ill patients:

- Theory and Method
  - Intermittent*
  - Continuous
    - CVVHF / HDF
    - PD
- Dose
- Timing
- Anticoagulation

The trials we have tend to merge these questions making the answers much harder to find

RRT in Critically Ill Patients

Prescribing RRT in critically ill patients:

- Theory and Method
  - – Intermittent*
  - – Continuous
    - CVVHF / HDF
    - PD
- Dose
- Timing
- ~~Anticoagulation~~

+ when to stop!

CRRT – Dose, Timing and Withdrawal

- Dose
  - What is dose?
  - 'A bit' v 'Some' v 'Loads'
- Timing
  - Early v Late
- Withdrawal
  - Will the renal function recover?
  - Palliative care

CRRT 'DOSE' – WHAT DOES THAT MEAN?

RRT and 'Dose'

'**DOSE**' of continuous and intermittent RRT

- 1995 – In ICU, mortality is inversely correlated to the dialysis dose[1]
- 1996 – More ultrafiltration is better[2]
- 1997 – Kt/V >1.0 per session improves mortality[3]
- 1999 – Early and more* CVVHF improved mortality[4]
- 1999 – Intermittent high volume CVVHF reduces mortality in critically ill patients[5]

* (measured in a strange way)

[1]Leblonc *KI suppl* 1995
[2]Brocklehurst *Anaesthesia* 1996
[3]Sigler *Adv Ren Replace Ther* 1997
[4]Gettings *ICM* 1999
[5]Oudemans *ICM* 1999

RRT and 'Dose'

- 'Dose' in IHD

RRT and 'Dose'

- 'Dose' in IHD
  - clearance of urea (K) — 200 $mL.min^{-1}$
  - Time (t) — 4 hrs = 240 min
  - Volume of body water (V) — 70kg x 0.6 = 42

Kt/V

1.14

RRT and 'Dose'

- 'Dose' in IHD
  - clearance of urea (K) — 200 mL.min^{-1}
  - Time (t) — 4 hrs = 240 min
  - Volume of body water (V) — 70kg x 0.6 = 42

  Kt/V 1.14

- 'Dose' in CVVHF
  - clearance of urea (K) — 16 mL.min^{-1}[(1)]
  - Time (t) — 24 hrs = 1440 min
  - Volume of body water (V) — 70kg x 0.6 = 42

  Kt/V 0.55

[1]Manns *AJKD* 1998

RRT and Increasing 'Dose'

- Increasing 'Dose' in HD
  - clearance of urea (K)
  - Time (t)
  - Volume of body water (V)

Increase pump speed
Improve dialyzer efficiency

Increase time

RRT and Increasing 'Dose'

- Increasing 'Dose' in HD
  - clearance of urea (K)
  - Time (t)
  - Volume of body water (V)
- Increasing 'Dose' in CVVHF
  - clearance of urea (K)
  - Time (t)
  - Volume of body water (V)

Increase pump speed
Improve dialyzer efficiency

Increase time

RRT and Increasing 'Dose'

Increasing solute clearance in hemofiltration
Increase transmembrane pressure
Suction on filtrate side
Predilution fluid replacement
Increase filter hydraulic permeability
Increase filter surface area
Increase blood flow
Add diffusion dialysis to convective ultrafiltration (hemodiafiltration, HDF)

Comprehensive Clinical Nephrology eds. Johnson & Feehally 2003

RRT and Increasing ‘Dose’

- Increasing ‘Dose’ in HD
  - clearance of urea (K) — Increase pump speed; Improve dialyzer efficiency
  - Time (t) — Increase time
  - Volume of body water (V)
- Increasing ‘Dose’ in CVVHF
  - clearance of urea (K) — 16 $mL.min^{-1}$[1]
  - Time (t) — 24 hrs = 1440 min
  - Volume of body water (V) — 70kg x 0.6 = 42

Kt/V

0.55

[1]Manns *AJKD* 1998

RRT and Increasing 'Dose'

- Increasing 'Dose' in HD
  - clearance of urea (K)
  - Time (t)
  - Volume of body water (V)

Increase pump speed
Improve dialyzer efficiency

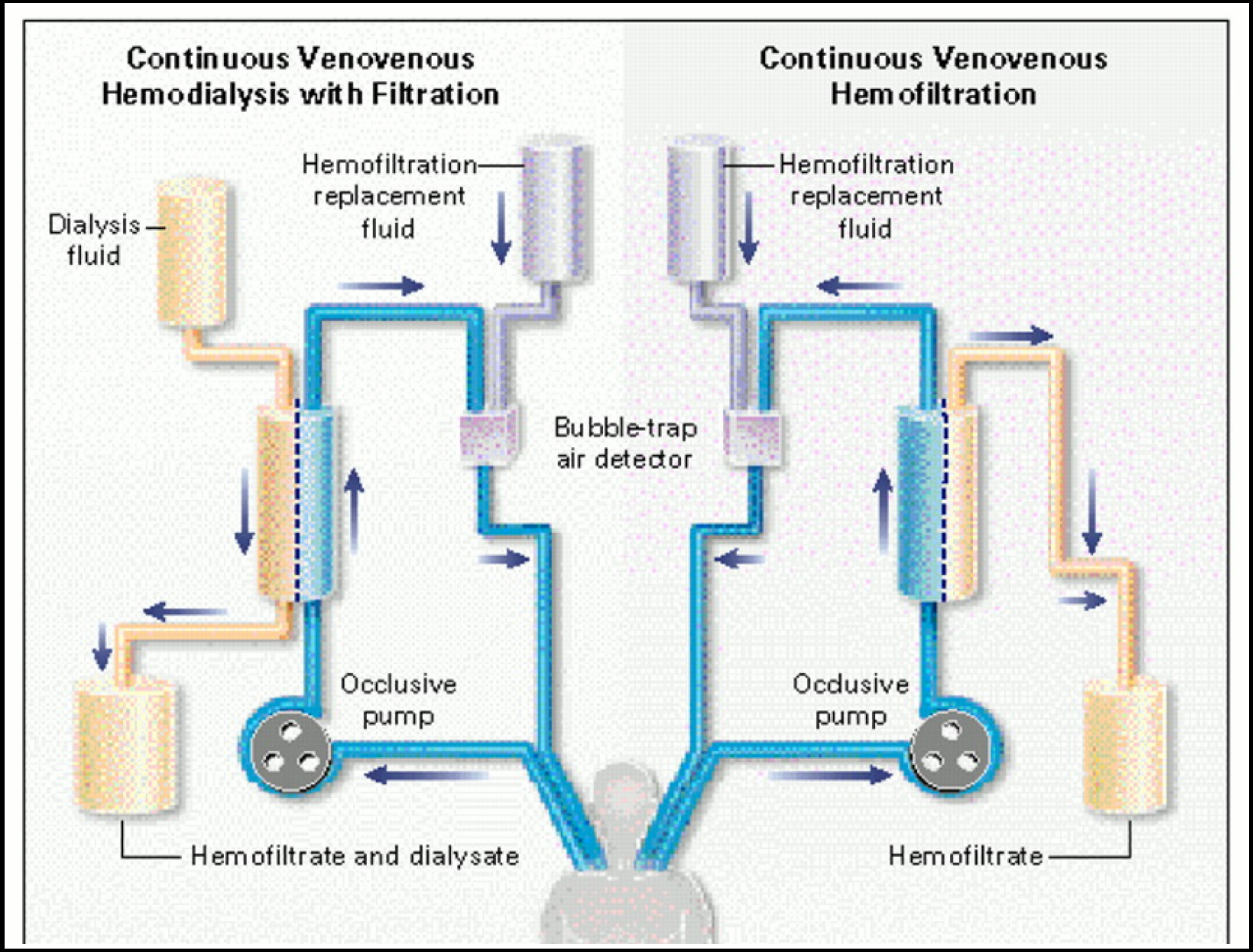
Increase time

- Increasing 'Dose' in CVVHDF
  - clearance of urea (K)
  - Time (t)
  - Volume of body water (V)

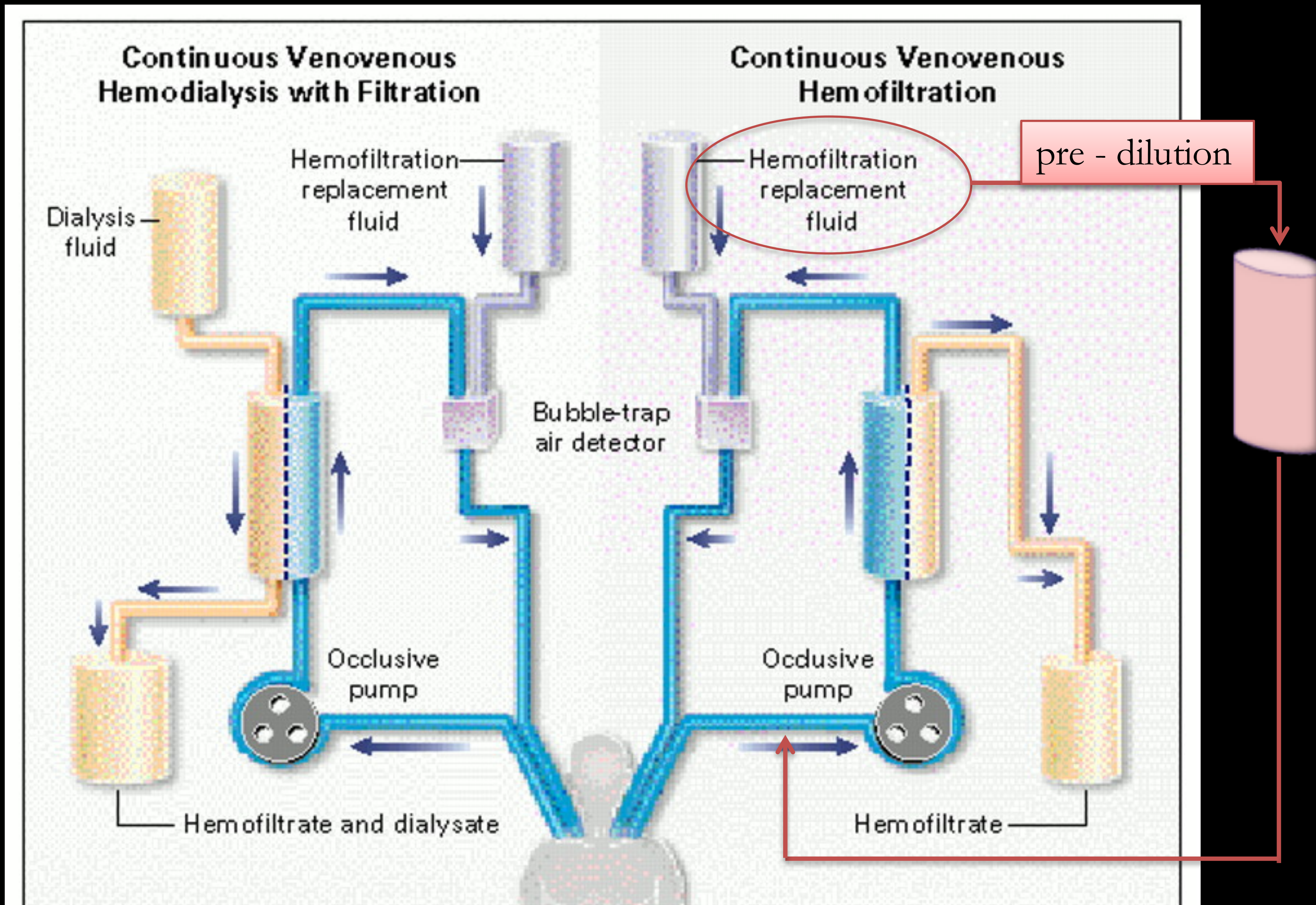
Increase ultra-filtrate production [1]
Add dialysis to filtration [2] 26mL.min^{-1} [3]

Kt/V = 0.89

[1]Brocklehurst *Anaesthseia* 1996
[2]Clarke *KI* 1998
[3]Manns *AJKD* 1998



Forni L and Hilton P. N Engl J Med 1997;336:1303-1309



Forni L and Hilton P. N Engl J Med 1997;336:1303-1309

Pre-dilution

- Pre-dilution will improve filtration fraction but reduce efficiency of dialysis
  - Net effect to improve small molecule removal
- Pre-dilution helps to reduce filter clotting
- If you need to do pre-dilution you may have to do CVVHF for technical reasons
- Some citrate mechanisms for HF / HDF are dependent on pre-dilution

A Simple way to Calculate Dose (urea clearance) in CVVHF / HDF

- The solute flux (i.e. how much you can clear) across the membrane is proportional to the ultra-filtration rate (Qf) but also dependant on the sieving coefficient (S)
- Sieving coefficient (S); is the ratio between the concentration of the solute in the ultra-filtrate and in plasma water.
- Solutes that freely cross membrane (Urea) S is equal or close to 1
- Urea Clearance = Qf

A Simple way to Calculate Dose (urea clearance) in CVVHF / HDF

As ultra-filtration rate corresponds to urea clearance in CVVHF, it can be used as a surrogate of treatment dose

- **Exchange rate = dose**

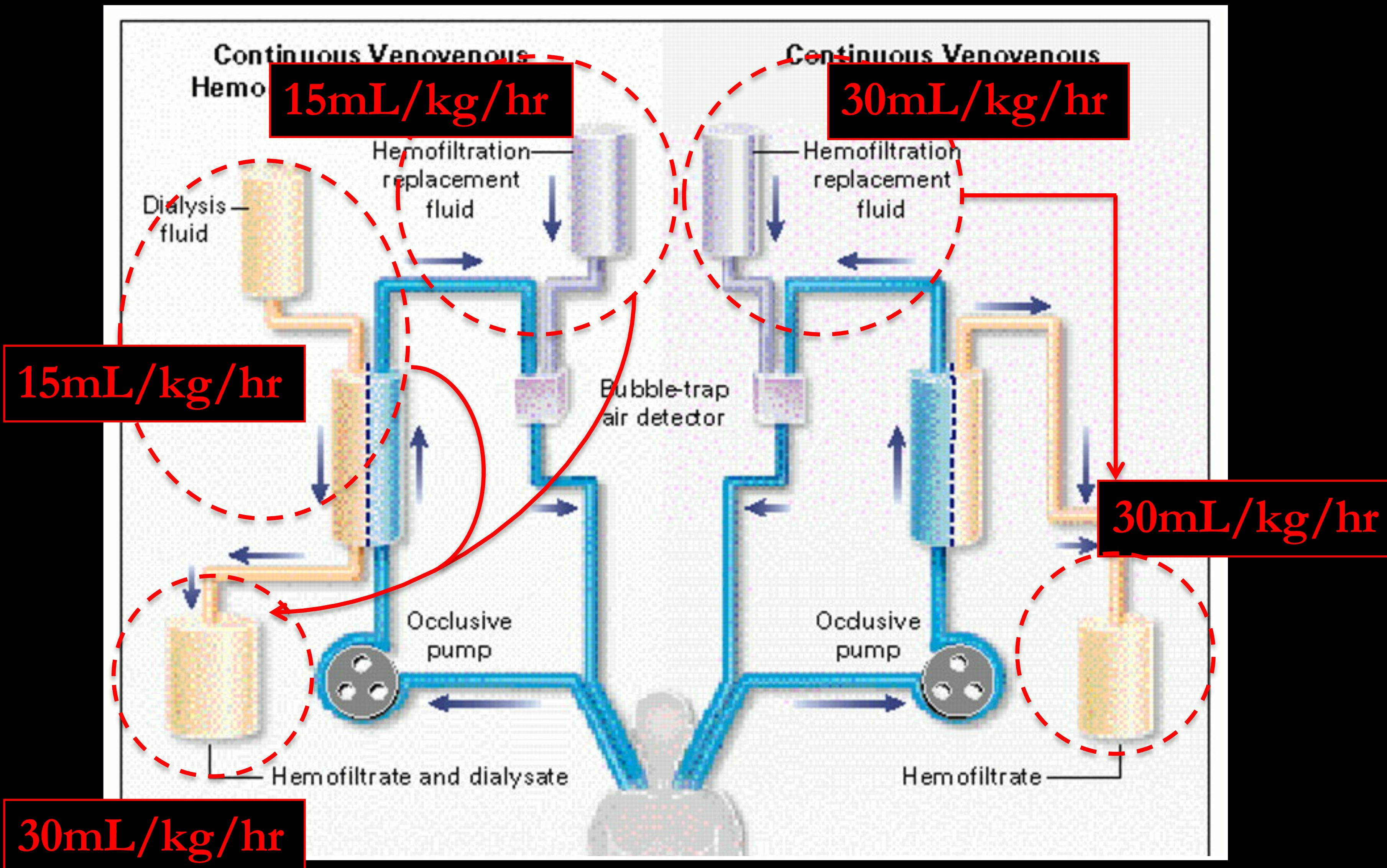
e.g. in a 70 kg patient

$30\ mL.kg^{-1}$ per hour ≈ 2 L exchange per hour

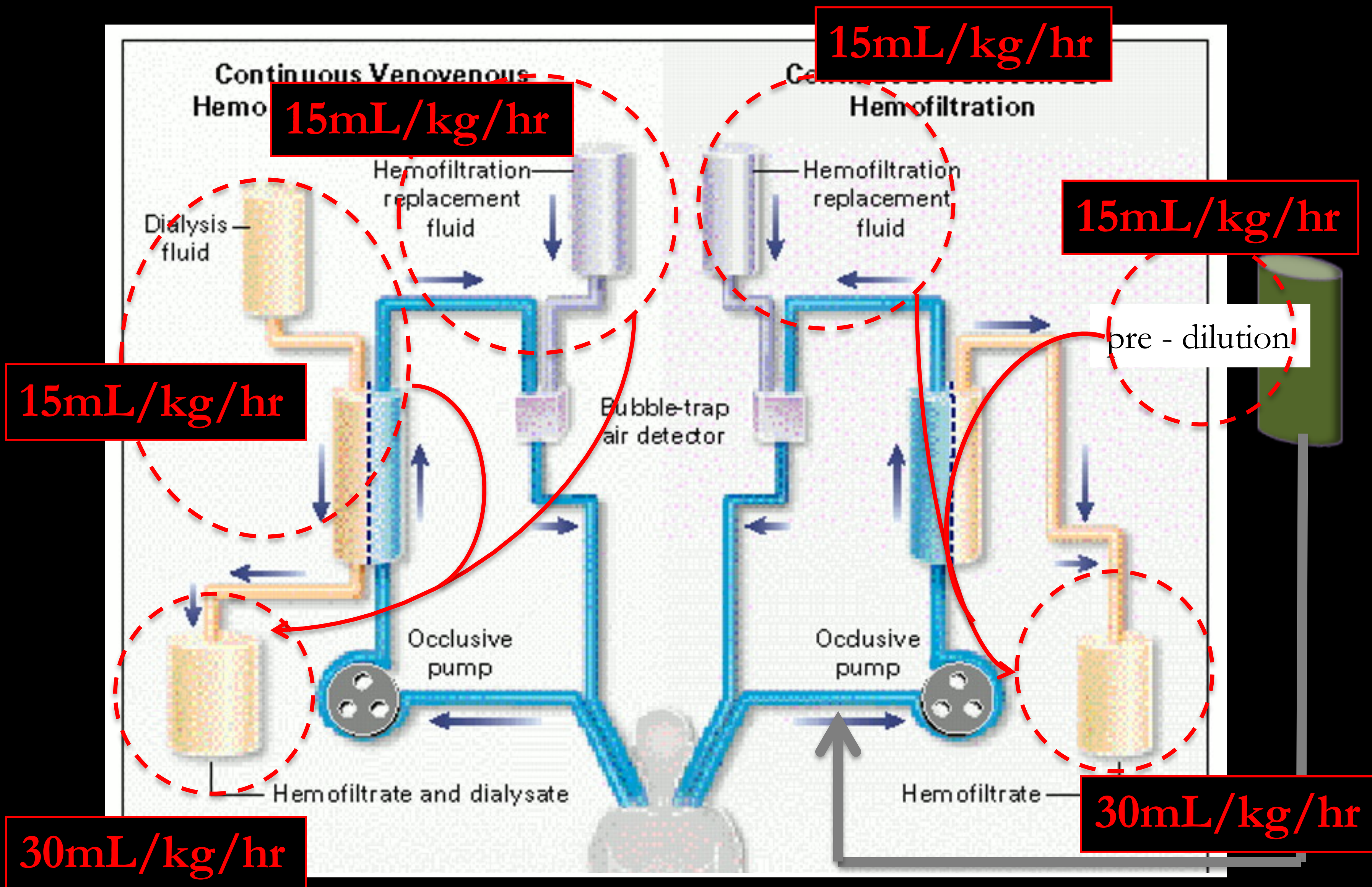
In CVVHDF, A combination of replacement fluid* and dialysate flow results in 'effluent rate' a surrogate of treatment dose

- **Effluent rate = dose**

e.g. $15\ mL.kg^{-1}$ per hour exchange + $15\ mL.kg^{-1}$ per hour dialysate flow = $30\ mL.kg^{-1}$ per hour of 'dose'



Forni L and Hilton P. N Engl J Med 1997;336:1303-1309



Forni L and Hilton P. N Engl J Med 1997;336:1303-1309

CRRT ‘DOSE’ – THE EVIDENCE

ARTICLES

Effects of different doses in continuous veno-venous haemofiltration on outcomes of acute renal failure: a prospective randomised trial

Claudio Ronco, Rinaldo Bellomo, Peter Homel, Alessandra Brendolan, Maurizio Dan, Pasquale Piccinni, Giuseppe La Greca

THE LANCET • Vol 356 • July 1, 2000

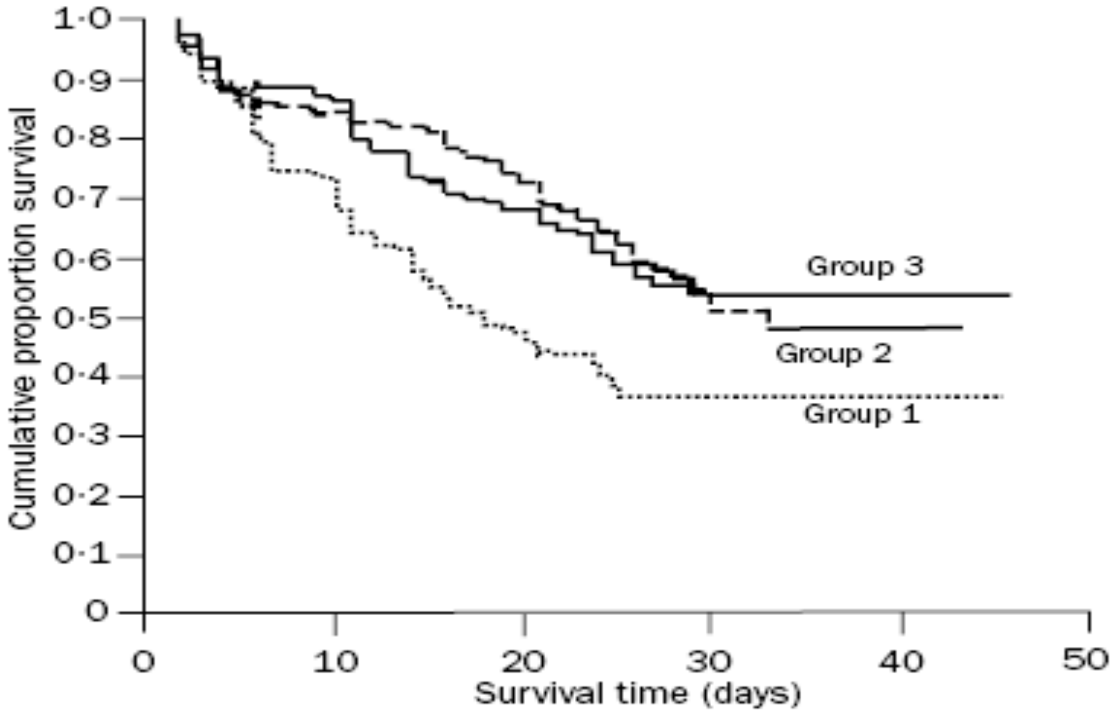


Figure 2: **Kaplan Meier estimation of survival rates in the three groups**

Dose	Day 15 Survival	Median Survival	P-value
45mL/kg	58%	46 days	0.0013
35mL/kg	57%	33 days	0.0007
20mL/kg	41%	19 days	

Adding a dialysis dose to continuous hemofiltration increases survival in patients with acute renal failure

P Saudan[1], M Niederberger[2], S De Seigneux[1], J Romand[2], J Pugin[2], T Perneger[3] and PY Martin[1]

[1]Nephrology Unit, University Hospitals of Geneva, Geneva, Switzerland; [2]Surgical and Medical Intensive Care Units, University Hospitals of Geneva, Geneva, Switzerland and [3]Quality of Care Service, University Hospitals of Geneva, Geneva, Switzerland

Kidney International (2006) **70**, 1312–1317

	CVVH group (*n*=102)	CVVHDF group (*n*=104)
Mean prescribed ultrafiltration dose (ml/kg/h)	25±5	24±6
Mean prescribed dialysis dose (ml/kg/h)	—	18±5
Bicarbonate replacement fluid (%)	58	52
Delivered dose during first 24 h (%)	87±11	83±16
T° after 24 h CRRT	36.6±0.7	36.7±0.7
CRRT-free days at day 28 (days)	22 (9)	23 (7)
Mechanical ventilation-free days at day 28 (days)	19 (10)	21 (9)
Cumulative NA dose (mg)	35 (1–172)	11 (0–107)
Duration of ICU stay (days)	6 (2–10)	8 (4–16)

42mL

22 v 36mL

Adding a dialysis dose to continuous hemofiltration increases survival in patients with acute renal failure

P Saudan[1], M Niederberger[2], S De Seigneux[1], J Romand[2], J Pugin[2], T Perneger[3] and PY Martin[1]

[1]*Nephrology Unit, University Hospitals of Geneva, Geneva, Switzerland;* [2]*Surgical and Medical Intensive Care Units, University Hospitals of Geneva, Geneva, Switzerland and* [3]*Quality of Care Service, University Hospitals of Geneva, Geneva, Switzerland*

Kidney International (2006) **70**, 1312–1317

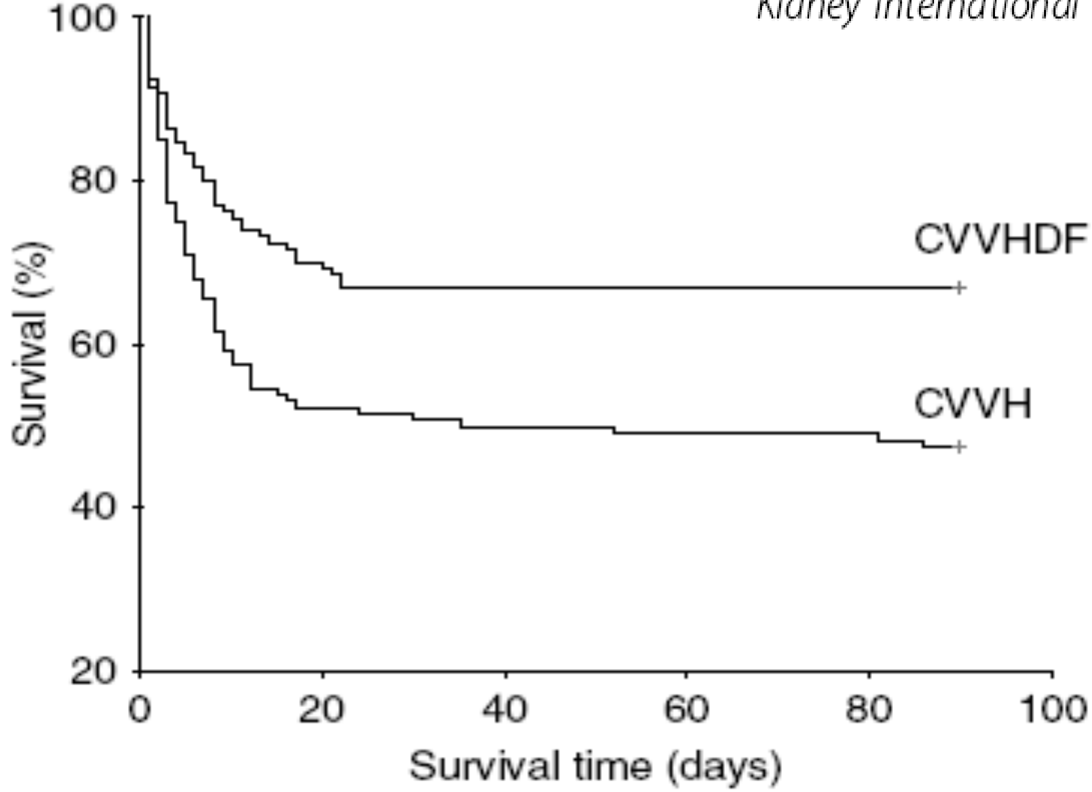


Figure 2 | Kaplan–Meier analysis of survival rates in the two groups.

Wald et al. Critical Care 2012, 16:R205
http://ccforum.com/content/16/5/R205

CRITICAL CARE

RESEARCH Open Access

Optimal Mode of clearance in critically ill patients with Acute Kidney Injury (OMAKI) - a pilot randomized controlled trial of hemofiltration versus hemodialysis: a Canadian Critical Care Trials Group project

Ron Wald[1,2*], Jan O Friedrich[2,3,4†], Sean M Bagshaw[5], Karen EA Burns[2,3,4], Amit X Garg[6], Michelle A Hladunewich[7,8], Andrew A House[6], Stephen Lapinsky[4,9], David Klein[2,3,4,10], Neesh I Pannu[11], Karen Pope[10], Robert M Richardson[12], Kevin Thorpe[10] and Neill KJ Adhikari[4,7†]

Method

Pilot study in haemodynamically unstable patients

39 patients at 35mL/kg/hr in each arm

Conclusions

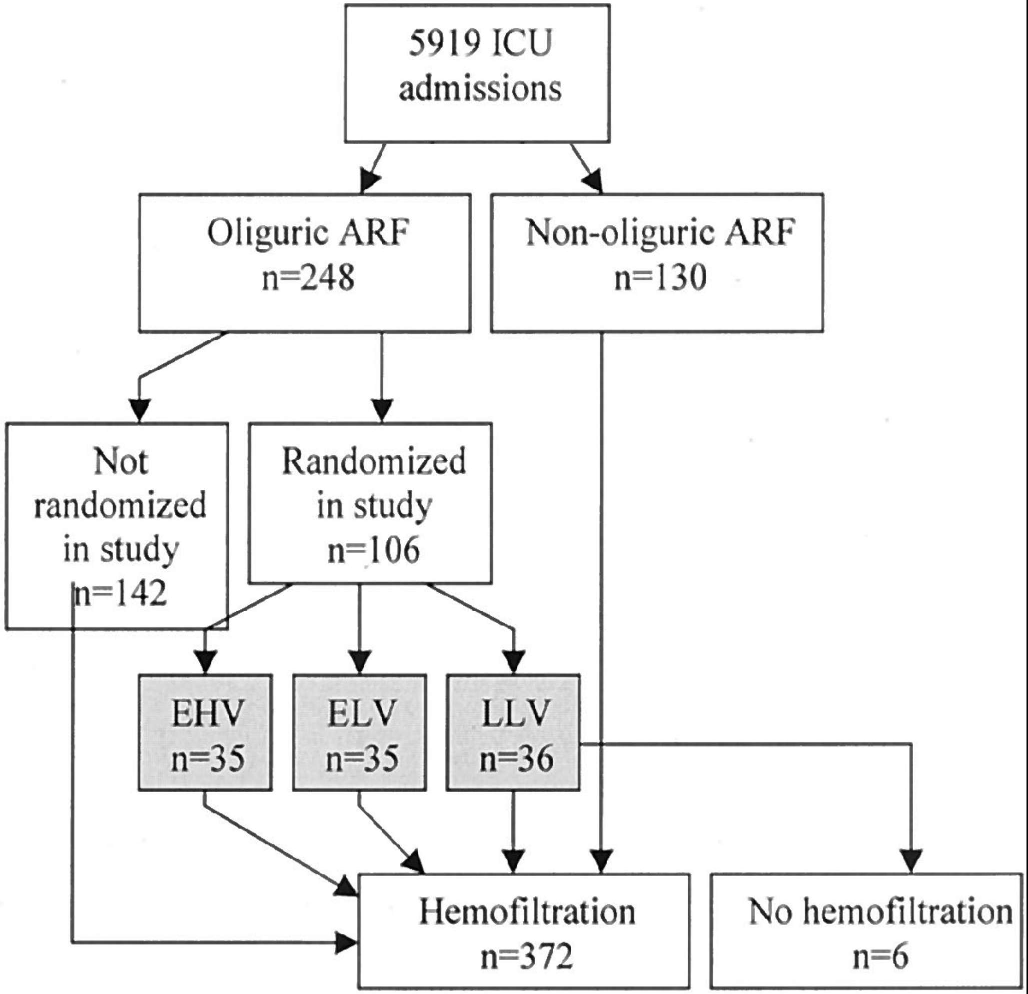
CVVHF may be slightly better in terms of reduced vasopressor requirement over CVVHDF

A large study looking at mortality is feasible

Effects of early high-volume continuous venovenous hemofiltration on survival and recovery of renal function in intensive care patients with acute renal failure: A prospective, randomized trial

Catherine S. C. Bouman, MD; Heleen M. Oudemans-van Straaten, MD, PhD; Jan G. P. Tijssen, MD, PhD; Durk F. Zandstra, MD, PhD; Jozef Kesecioglu, MD, PhD

Crit Care Med 2002 Vol. 30, No. 10



On average:

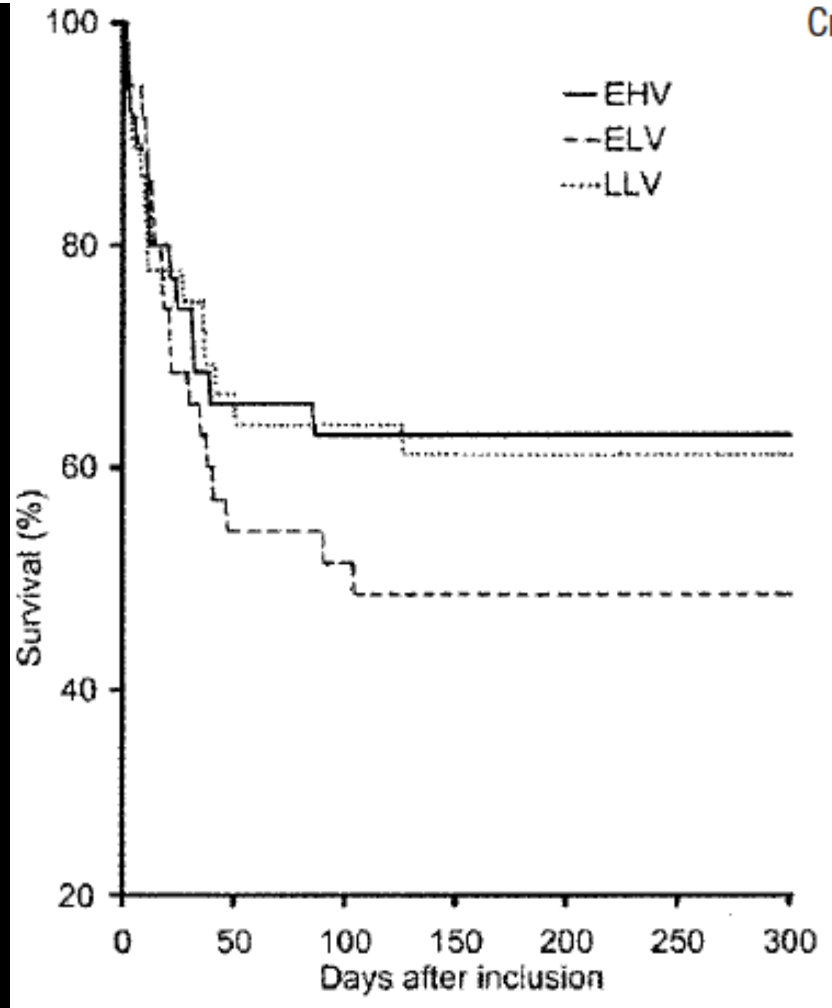
HV = 48ml.kg per hr^{-1}

LV = 19mL.kg per hr^{-1}

Effects of early high-volume continuous venovenous hemofiltration on survival and recovery of renal function in intensive care patients with acute renal failure: A prospective, randomized trial

Catherine S. C. Bouman, MD; Heleen M. Oudemans-van Straaten, MD, PhD; Jan G. P. Tijssen, MD, PhD; Durk F. Zandstra, MD, PhD; Jozef Kesecioglu, MD, PhD

Crit Care Med 2002 Vol. 30, No. 10



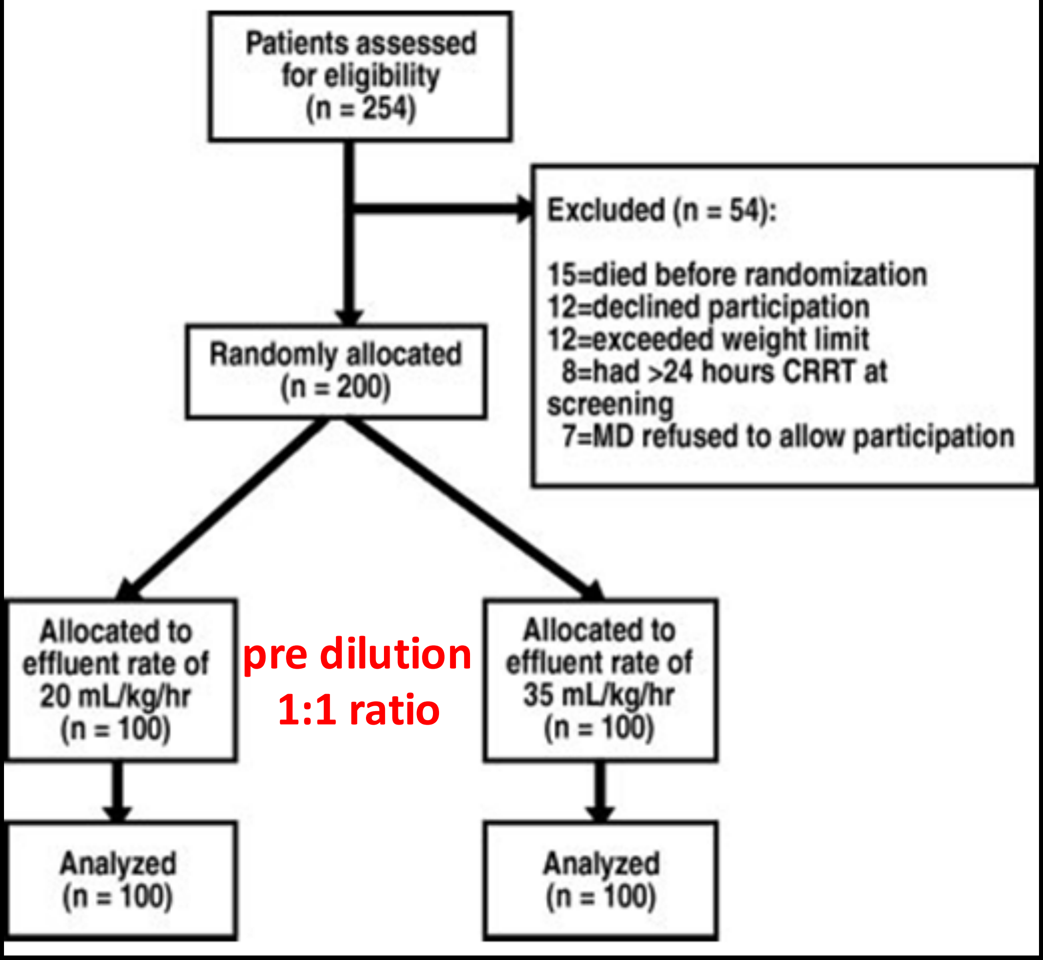
NS

CLINICAL RESEARCH www.jasn.org

Standard *versus* High-Dose CVVHDF for ICU-Related Acute Renal Failure

Ashita J. Tolwani,* Ruth C. Campbell,* Brenda S. Stofan,* K. Robin Lai,† Robert A. Oster,* and Keith M. Wille*

Departments of *Medicine and †Emergency Medicine, University of Alabama at Birmingham, Birmingham, Alabama



CLINICAL RESEARCH www.jasn.org

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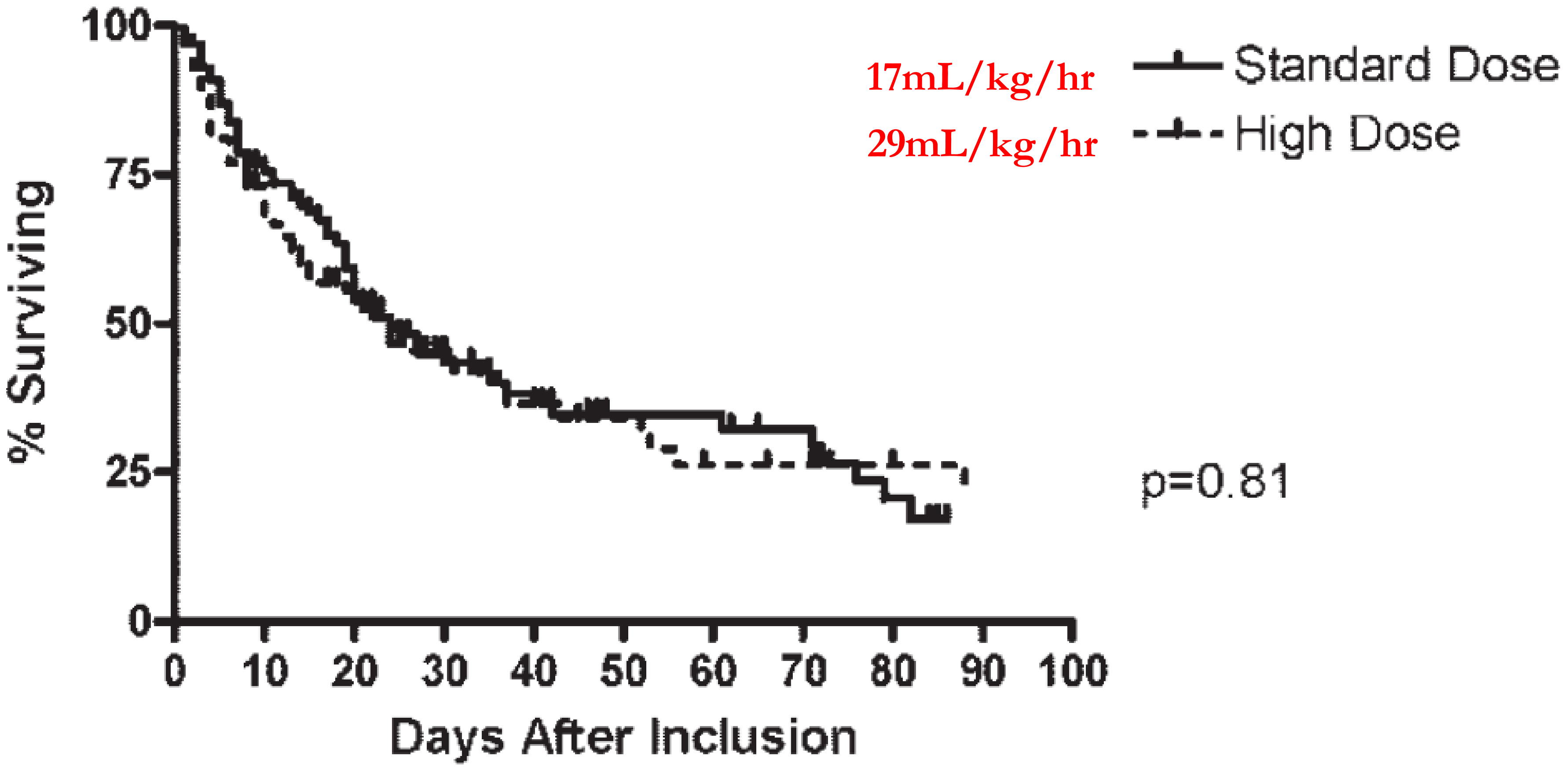


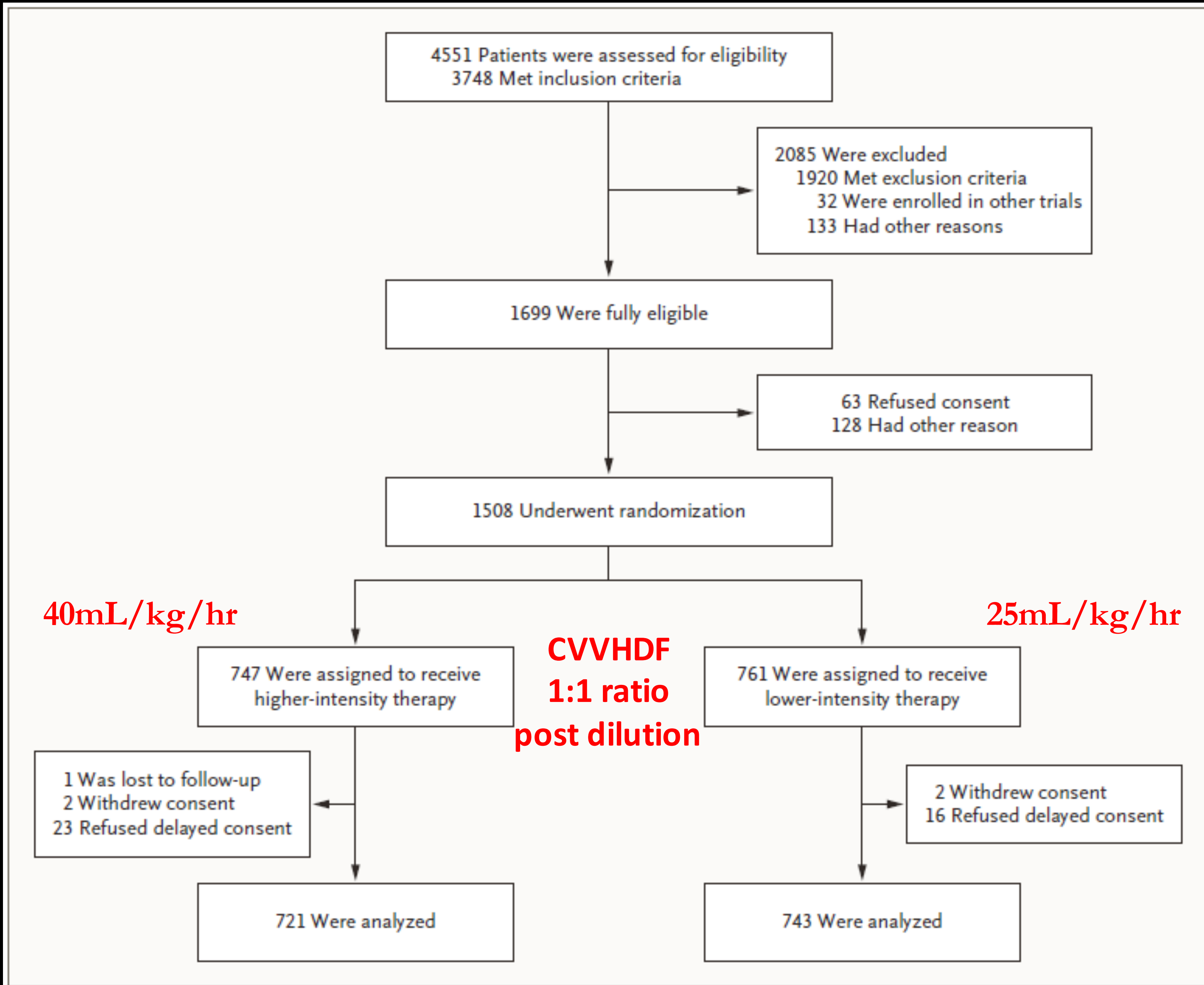
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 22, 2009 VOL. 361 NO. 17

Intensity of Continuous Renal-Replacement Therapy in Critically Ill Patients

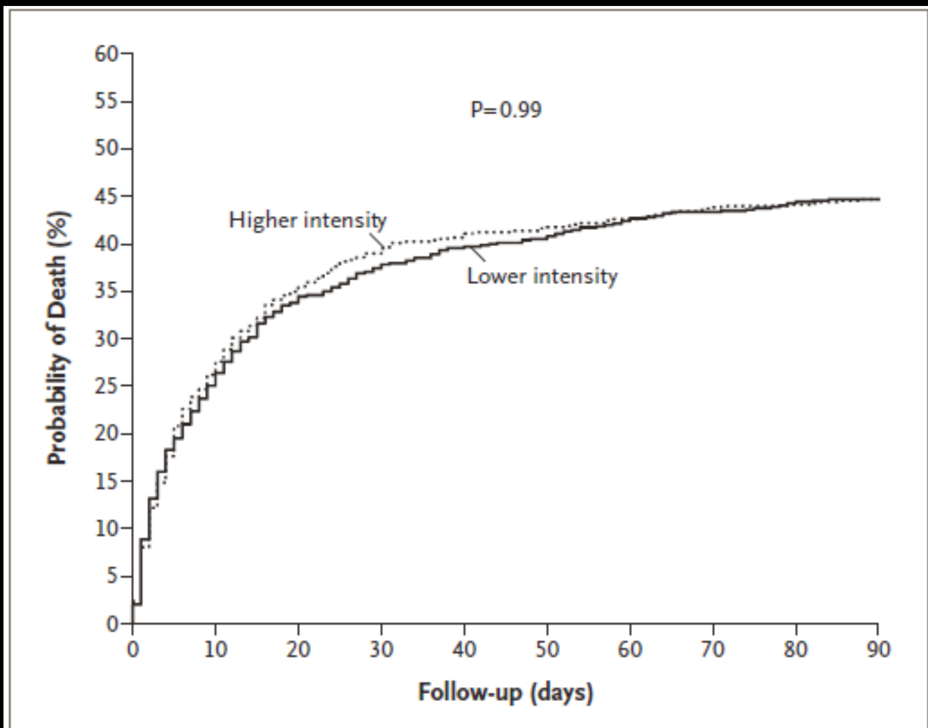
The RENAL Replacement Therapy Study Investigators*

The Randomized Evaluation of Normal versus Augmented Level (RENAL) Replacement Therapy Study is a collaboration of the Australian and New Zealand Intensive Care Society Clinical Trials Group and the George Institute for International Health.


4551 Patients were assessed for eligibility
3748 Met inclusion criteria
2085 Were excluded
1920 Met exclusion criteria
32 Were enrolled in other trials
133 Had other reasons
1699 Were fully eligible
63 Refused consent
128 Had other reason
1508 Underwent randomization
40mL/kg/hr
25mL/kg/hr
CVVHDF
1:1 ratio
post dilution
747 Were assigned to receive higher-intensity therapy
761 Were assigned to receive lower-intensity therapy
1 Was lost to follow-up
2 Withdrew consent
23 Refused delayed consent
2 Withdrew consent
16 Refused delayed consent
721 Were analyzed
743 Were analyzed

Intensity of Continuous Renal-Replacement Therapy in Critically Ill Patients

The RENAL Replacement Therapy Study Investigators*



Both groups received less treatment than prescribed

33 mL.kg^{-1} v 22 mL.kg^{-1}

High intensity group required more heparin and <u>more filters</u> per day (0.93 vs. 0.84, p<0.001)

Hypophospataemia

H 65.1% v L 54% p<0.001

The NEW ENGLAND JOURNAL of MEDICINE

Effect of Hypophosphatemia on Diaphragmatic Contractility in Patients with Acute Respiratory Failure

Michel Aubier, M.D., Daniéle Murciano, M.D., Yann Lecocguic, M.D., Naïma Viires, Ph.D., Yves Jacquens, M.D., Pierre Squara, M.D., and René Pariente, M.D.

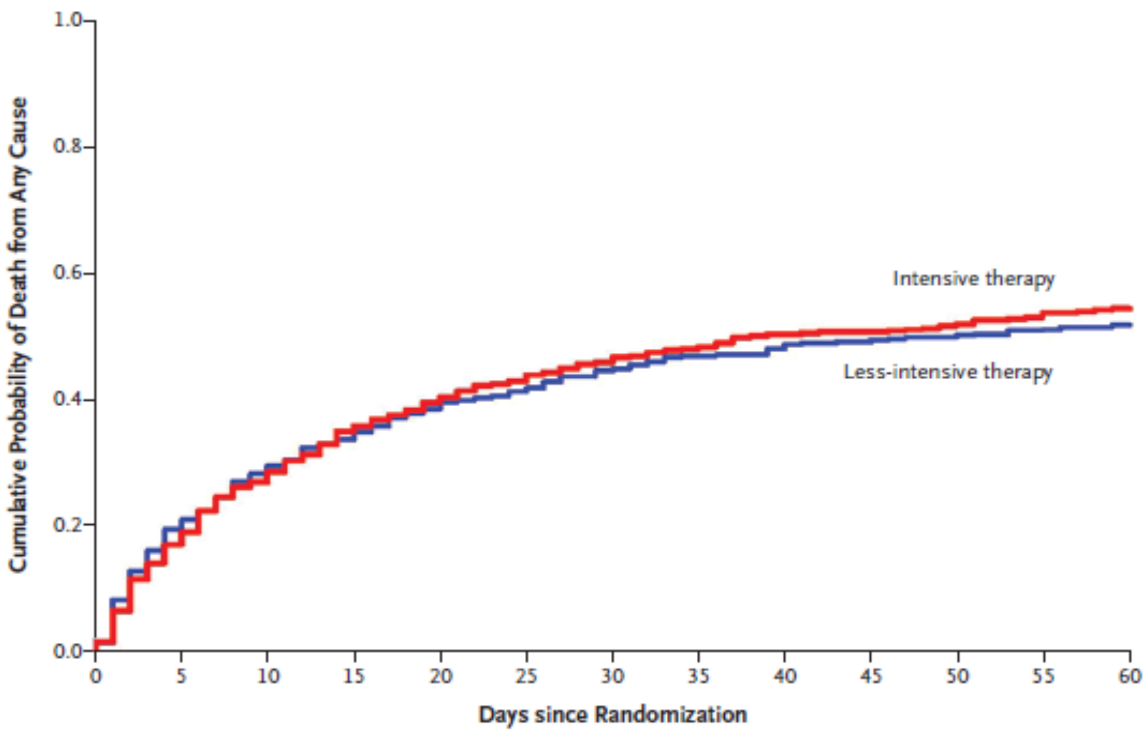
N Engl J Med 1985; 313:420-424 | August 15, 1985

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JULY 3, 2008 VOL. 359 NO. 1

Intensity of Renal Support in Critically Ill Patients with Acute Kidney Injury

The VA/NIH Acute Renal Failure Trial Network*



Our prescription so far

- Adding dialysis to CVVHF may improve outcome in AKI

- CVVHDF at 25(30)mL/kg/hr
  - D to F ratio of 1:1
  - An increased exchange rate / effluent rate probably does not improve mortality in AKI

CRRT – CAN A HIGHER DOSE EVER BE BETTER?

Sepsis?

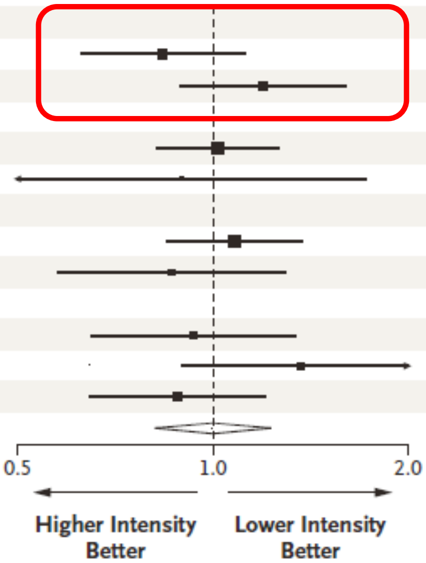
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 22, 2009 VOL. 361 NO. 17

Intensity of Continuous Renal-Replacement Therapy in Critically Ill Patients

The RENAL Replacement Therapy Study Investigators*

Prespecified Subgroup	Higher Intensity (N=721)	Lower Intensity (N=743)	Odds Ratio (95% CI)
	no. of deaths/no. of patients (%)		
Patients with criteria for sepsis			
Yes	168/359 (46.8)	186/363 (51.2)	0.84 (0.62–1.12)
No	154/362 (42.5)	145/379 (38.3)	1.19 (0.89–1.60)
Patients with at least one nonrenal organ failure			
Yes	299/628 (47.6)	306/649 (47.2)	1.02 (0.82–1.27)
No	23/93 (24.7)	25/93 (26.9)	0.89 (0.46–1.72)
Patients with SOFA cardiovascular score of 3 or 4			
Yes	247/510 (48.4)	254/546 (46.5)	1.08 (0.85–1.37)
No	74/210 (35.2)	75/194 (38.7)	0.86(0.58–1.29)
Patients with eGFR <60 ml/min			
Yes	114/250 (45.6)	105/222 (47.3)	0.93 (0.65–1.34)
No	81/157 (51.6)	81/185 (43.8)	1.37 (0.89–2.10)
Missing	127/314 (40.5)	146/336 (43.5)	0.88 (0.65–1.21)
Death from any cause by day 90	322/721 (44.7)	332/743 (44.7)	1.00 (0.81–1.23)



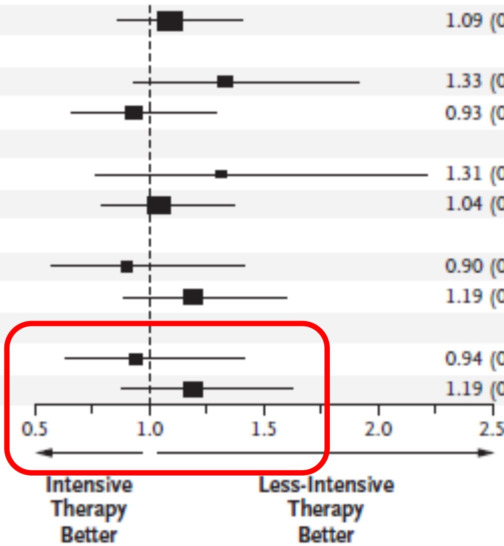
The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JULY 3, 2008 VOL. 359 NO. 1

Intensity of Renal Support in Critically Ill Patients with Acute Kidney Injury

The VA/NIH Acute Renal Failure Trial Network*

Baseline Characteristic	No. of Patients	Intensive Therapy	Less-Intensive Therapy	Odds Ratio for Death at 60 Days (95% CI)	P Value for Interaction
Overall	1124	53.6	51.5	1.09 (0.86–1.40)	
SOFA cardiovascular score					0.15
0–2	509	43.9	37.8	1.33 (0.93–1.91)	
3–4	615	61.7	62.9	0.93 (0.66–1.29)	
Oliguria					0.45
No	247	41.1	36.6	1.31 (0.77–2.21)	
Yes	877	57.2	55.7	1.04 (0.79–1.37)	
Sex					0.30
Female	330	50.7	52.8	0.90 (0.57–1.41)	
Male	793	54.8	50.8	1.19 (0.89–1.60)	
Sepsis					0.36
No	416	47.8	49.8	0.94 (0.63–1.41)	
Yes	708	57.0	52.6	1.19 (0.88–1.62)	



ClinicalTrials.gov
A service of the U.S. National Institutes of Health

Haemofiltration Study : IVOIRE (hIgh VOlume in Intensive Care)

This study has been completed.

First Received on October 17, 2005. Last Updated on October 12, 2010 History of Changes

Sponsor:	University Hospital, Bordeaux
Collaborator:	Ministry of Health, France
Information provided by:	University Hospital, Bordeaux
ClinicalTrials.gov Identifier:	NCT00241228

CVVHF

35mL/kg/h v 70mL/kg/hr

INTENSIVE CARE MEDICINE

OFFICIAL JOURNAL OF THE
EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE
AND THE
EUROPEAN SOCIETY OF PAEDIATRIC & NEONATAL INTENSIVE CARE

ORIGINAL

High-volume versus standard-volume haemofiltration for septic shock patients with acute kidney injury (IVOIRE study): a multicentre randomized controlled trial

Original
Online First ™ - June , 2013
Pages 1 - 12

NO DIFFERENCE in 28 day mortality or early improvements in haemodynamic profile or organ function between 70mL/kg v 35 mL/kg

P212 High-volume continuous veno-venous haemofiltration in hyper-acute liver failure: a pilot study

W Bernal, T Wong and J Wendon
Institute of Liver Studies, Kings College Hospital, Denmark Hill, London SE5 9RS, UK

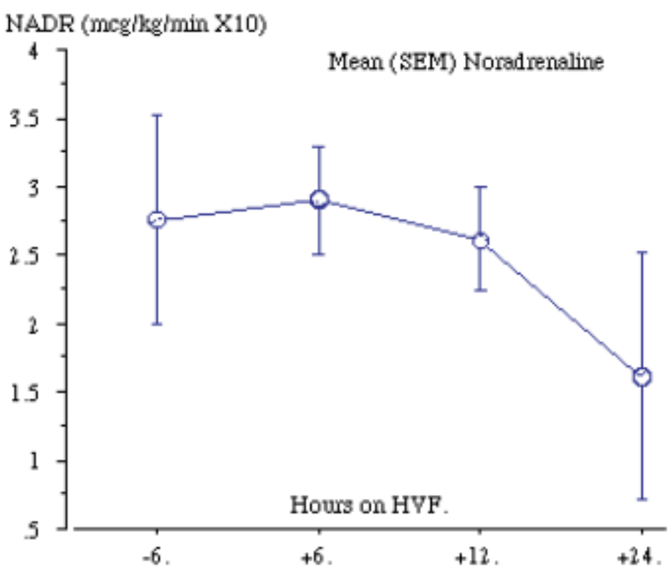
Crit Care 1999, **3 (suppl 1)**:P212

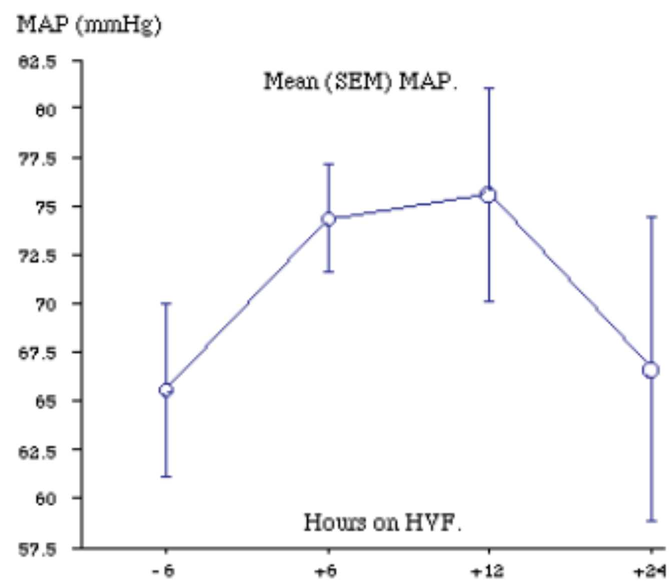
Background: Once defined clinical criteria are fulfilled in hyper-acute liver failure (ALF) mortality without liver transplantation (OLT) approaches 90%. Patients' clinical condition may deteriorate whilst awaiting a graft, such that transplantation becomes impossible due to the rapid progression of multiple organ failure. There is need for therapies that may stabilise the patient and thus provide a 'bridge to transplantation'. Animal studies suggest that high-volume continuous veno-venous haemofiltration (HVF) in septic shock is associated with improvements in haemodynamic stability and a reduction in the requirement for vasopressor support. We report findings of a pilot study of HVF in patients with ALF.

Patients and methods: Eight patients fulfilling transplantation criteria with acetaminophen induced ALF were studied. Median age was 28 years (range 19–51), INR 4.6 (1.9–15), pH 7.23 (7.1–7.42), lactate 9.4 mmol/l (6.7–17) and APACHE II 24 (22–34). Six patients (75%) were receiving vasopressor support with noradrenaline at 0.29 μg/kg/min (0.03–0.5) and all were in anuric renal failure. Five patients were already established on conventional veno-venous filtration. HVF (Baxter system) was commenced 2 days (1–4) after admission using buffer-free dialysate at 4000 ml/h (3500-6000) with concurrent $NaHCO_3$ infusion and filter surface area 1.25 m^2 for a median of 34 h (22–72).

Results: HVF resulted in a rapid correction of pH and significant reductions in both serum lactate and base deficit within 24 h. Mean arterial pressure was increased after 6 and 12 h of HVF ($P < 0.13$) without corresponding increases in vasopressor support (Figure). After 24 h of HVF four (50%) patients required noradrenaline at 1.45 μg/kg/min (0.025–0.4). Two patients underwent OLT and survived, and 1 patient survived without transplantation.

Conclusions: HVF effectively corrects acidosis in patients with ALF and is associated with improvements in haemodynamic stability. Its use in the support of patients awaiting transplantation deserves further investigation.





Pancreatitis?

PO Box 2345, Beijing 100023, China
www.wjgnet.com
wjg@wjgnet.com

ELSEVIER

World J Gastroenterol 2005;11(31):4815-4821
World Journal of Gastroenterology ISSN 1007-9327

• *BASIC RESEARCH* •

Influence of continuous veno-venous hemofiltration on the course of acute pancreatitis

Hong-Li Jiang, Wu-Jun Xue, Da-Qing Li, Ai-Ping Yin, Xia Xin, Chun-Mei Li, Ju-Lin Gao

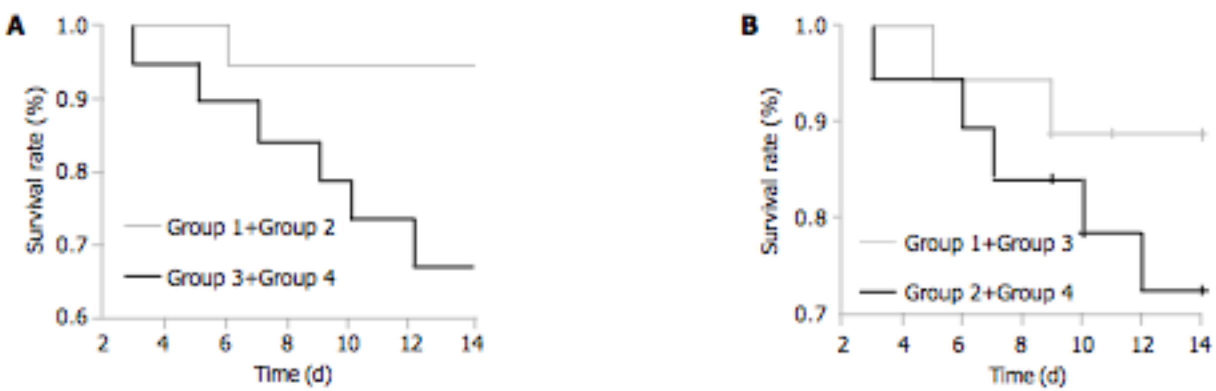


Figure 1 Survival rate of different intensifying CVVH (**A**) and different start time of CVVH (**B**).

CRRT – WHEN TO START?

Effects of early high-volume continuous venovenous hemofiltration on survival and recovery of renal function in intensive care patients with acute renal failure: A prospective, randomized trial

Catherine S. C. Bouman, MD; Heleen M. Oudemans-van Straaten, MD, PhD; Jan G. P. Tijssen, MD, PhD; Durk F. Zandstra, MD, PhD; Jozef Kesecioglu, MD, PhD

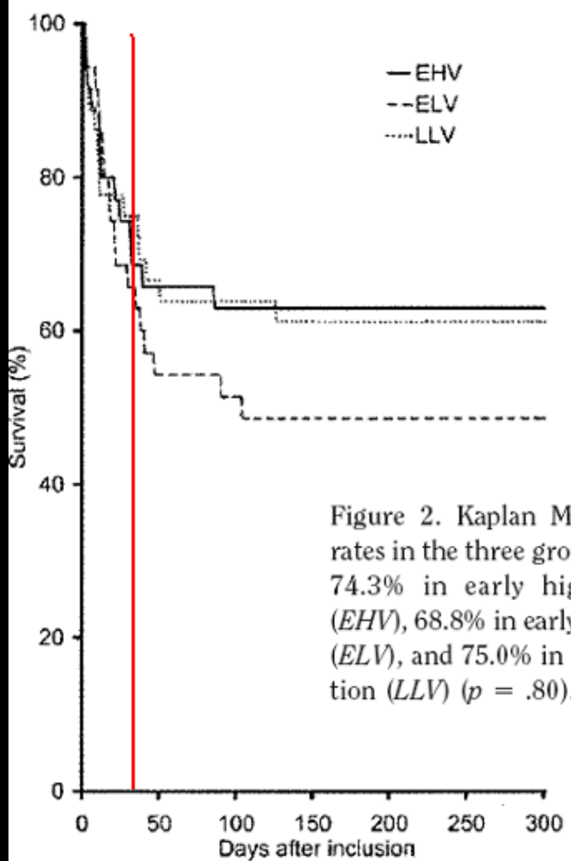


Figure 2. Kaplan Meier estimation of survival rates in the three groups. The 28-day survival was 74.3% in early high-volume hemofiltration (*EHV*), 68.8% in early low-volume hemofiltration (*ELV*), and 75.0% in late low-volume hemofiltration (*LLV*) (p = .80).

Hemodialysis International 2004; **8**: 320–325

Original Articles

Early start on continuous hemodialysis therapy improves survival rate in patients with acute renal failure following coronary bypass surgery

Souichi SUGAHARA, Hiromichi SUZUKI
Department of Nephrology, Saitama Medical School, Saitama Prefecture, Japan

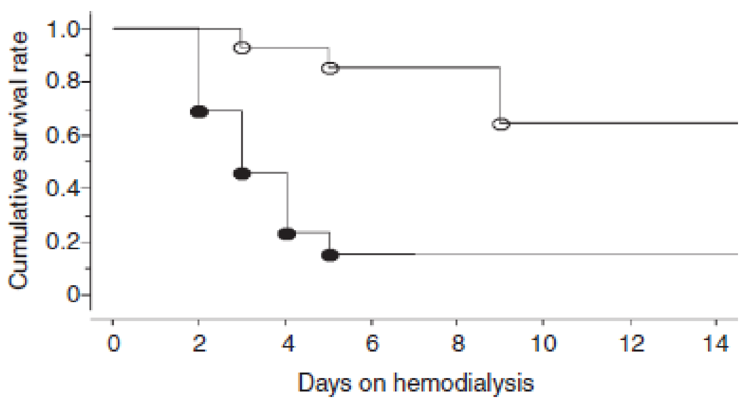


Figure 1 Kaplan-Meier curves showing the survival rates of the two groups. (○) group 1, patients who received the early-start dialysis; (●) group 2, patients who received the conventional-start dialysis. There was a significant difference between the two groups ($p < 0.01$).

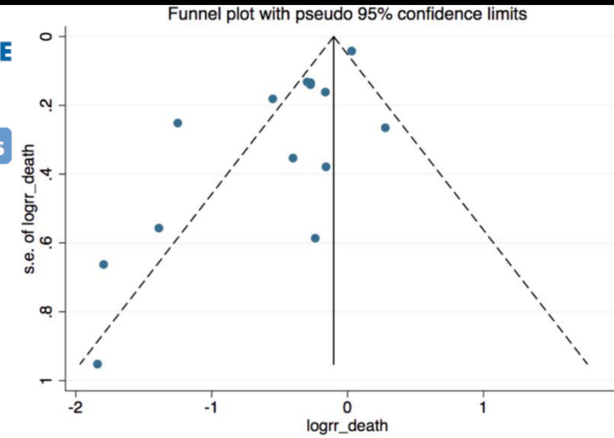
Karvellas *et al. Critical Care* 2011, **15**:R72
http://ccforum.com/content/15/1/R72

CRITICAL CARE

RESEARCH Open Access

A comparison of early versus late initiation of renal replacement therapy in critically ill patients with acute kidney injury: a systematic review and meta-analysis

Constantine J Karvellas[1], Maha R Farhat[2], Imran Sajjad[3], Simon S Mogensen[4], Alexander A Leung[5], Ron Wald[6], Sean M Bagshaw[1*]



Group by Subgroup within study	Study name	Subgroup within study	Point	Lower limit	Upper limit	Z-Value	p-Value
Mixed	Bouman 2002	Mixed	1.375	0.487	3.884	0.601	0.548
Mixed	Liu 2006	Mixed	0.867	0.545	1.379	-0.603	0.547
Mixed	Sabater 2008	Mixed	0.608	0.196	1.889	-0.861	0.389
Mixed	Bagshaw 2010*	Mixed	0.889	0.416	1.897	-0.305	0.760
Mixed	Andrade 2007	Mixed	0.607	0.257	1.437	-1.136	0.256
Mixed	Bagshaw 2009 adj	Mixed	0.818	0.461	1.452	-0.686	0.493
Mixed	Carl 2010 adj	Mixed	0.705	0.402	1.237	-1.217	0.224
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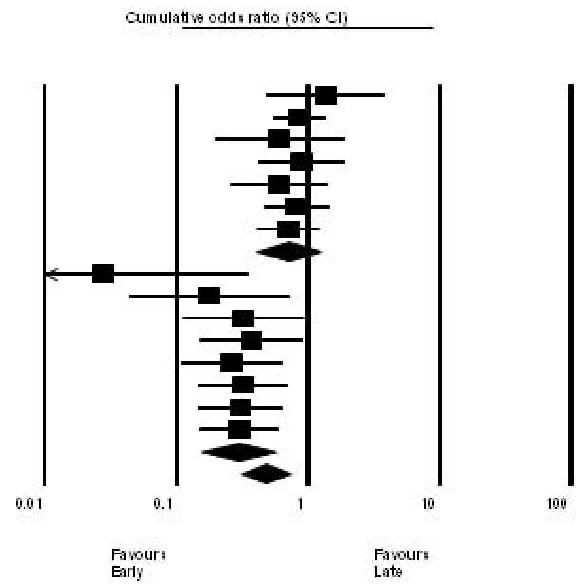
Surgery	Sugahara 2004	Surgery	0.028	0.002	0.358	-2.747	0.006
Surgery	Gettings 1999	Surgery	0.178	0.044	0.724	-2.411	0.016
Surgery	Elahi 2004	Surgery	0.321	0.110	0.938	-2.078	0.038
Surgery	Demirkilic 2004	Surgery	0.372	0.152	0.910	-2.166	0.030
Surgery	Manche 2008	Surgery	0.263	0.108	0.639	-2.946	0.003
Surgery	Iyem 2009	Surgery	0.319	0.144	0.706	-2.820	0.005
Surgery	Shiao 2009	Surgery	0.306	0.147	0.636	-3.171	0.002
Surgery	Wu 2007 adj	Surgery	0.300	0.151	0.598	-3.425	0.001
Surgery			0.306	0.162	0.580	-3.634	0.000
Overall			0.490	0.321	0.747	-3.316	0.001

Cumulative statistics

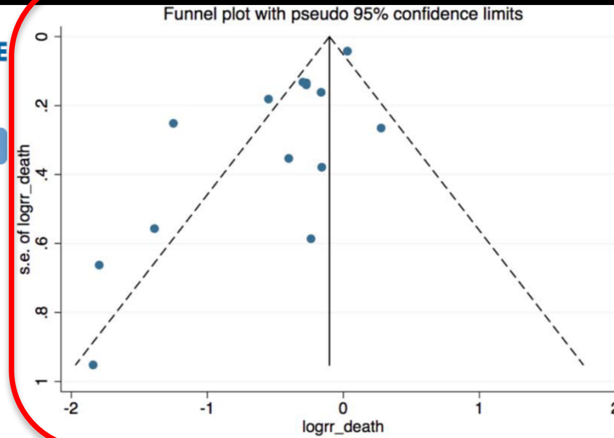


Meta Analysis

Karvellas *et al. Critical Care* 2011, **15**:R72
http://ccforum.com/content/15/1/R72

CRITICAL CARE

RESEARCH Open Access



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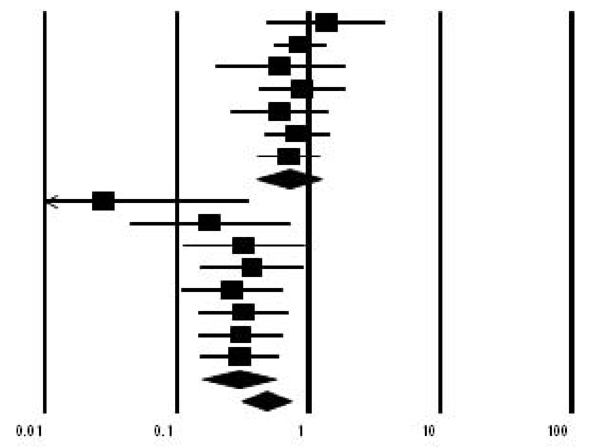
Surgery			0.306	0.162	0.580	-3.634	0.000
Overall			0.490	0.321	0.747	-3.316	0.001

Cumulative odds ratio (95% CI)



Meta Analysis

CRRT – WHEN TO START

- Acidosis
- Hyperkalaemia
- Pulmonary oedema

Especially if anuric / oliguric

+

- Uraemia (>60?)
- Toxin removal / Poisoning

+

- FLUID OVERLOAD

Nephrol Dial Transplant (2012) 27: 2242–2248
doi: 10.1093/ndt/gfr707
Advance Access publication 9 January 2012

Original Articles

NDT
Nephrology Dialysis Transplantation

Renal replacement therapy in critically ill patients with acute kidney injury—when to start

Marlies Ostermann, Helen Dickie and Nicholas A. Barrett

Department of Critical Care, King's College London, King's Health Partners, Guy's & St Thomas' Foundation Trust, London, UK

Correspondence and offprint requests to: Marlies Ostermann; E-mail: Marlies.Ostermann@gstt.nhs.uk

2 RCT
13 retrospective cohort studies
3 meta analysis / systemic reviews

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When clinically indicated!

Nephrol Dial Transpl
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Advance Access publ

Original Art

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Marlies Osterma

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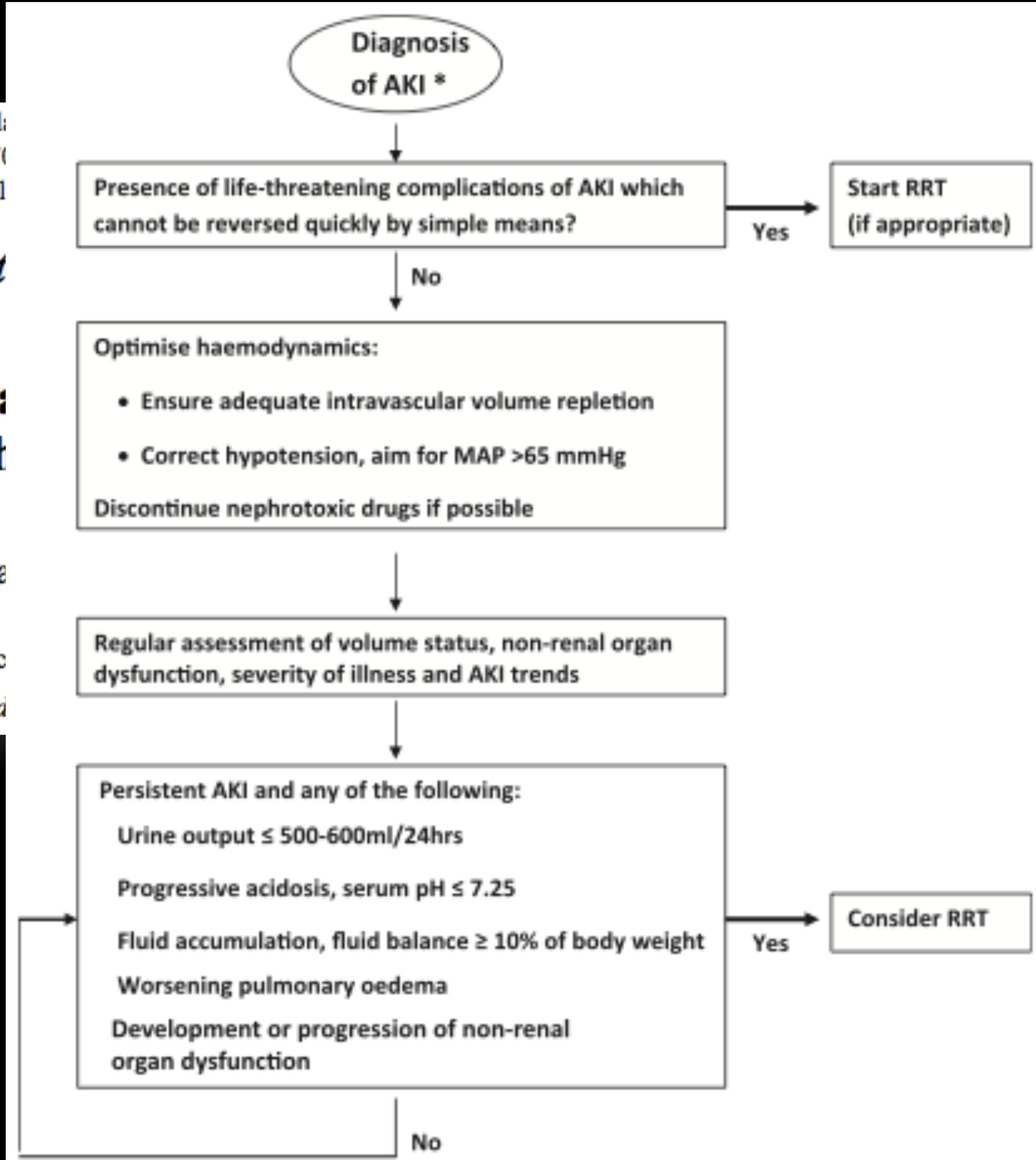

Novel idea?

Chawla *et al. Critical Care* 2013, **17**:R207
http://ccforum.com/content/17/5/R207

CRITICAL CARE

RESEARCH **Open Access**

Development and Standardization of a Furosemide Stress Test to Predict the Severity of Acute Kidney Injury

Lakhmir S Chawla[1,2*], Danielle L Davison[1], Ermira Brasha-Mitchell[1], Jay L Koyner[3], John M Arthur[4], Andrew D Shaw[5], James A Tumlin[6], Sharon A Trevino[3], Paul L Kimmel[7] and Michael G Seneff[1]

CRRT – WHEN TO STOP?

CRRT – When to Stop

Discontinuation of continuous renal replacement therapy: A *post hoc* analysis of a prospective multicenter observational study*

Shigehiko Uchino, MD; Rinaldo Bellomo, MD; Hiroshi Morimatsu, MD; Stanislao Morgera, MD; Miet Schetz, MD; Ian Tan, MD; Catherine Bouman, MD; Ettiene Macedo, MD; Noel Gibney, MD; Ashita Tolwani, MD; Heleen Oudemans-van Straaten, MD; Claudio Ronco, MD; John A. Kellum, MD

- Filter holidays
- ‘natural’ urine output > 450mLs in a day
  - Not improved by furosemide

CRRT - When to Stop

- Decision to withdrawal critical care
- Decision not to provide out patient RRT
  - Discuss with a nephrologist
  - Can this patient realistically sustain outpatient RRT
    - E.g. 30yo PVS following HTN ICH presenting with CKD 5
      - Oncology use ‘performance status’ ?relevant for RRT
    - No long term access

Summary

- 25mL/kg/hr
- CVVHDF
- Start when you need to
  - Fluid overload is a GOOD reason to start (especially in critical illness associated AKI)
- Critically ill patients are likely to remain independent of RRT when u/o >450mLs/day
  - Without furosemide
- Nephrology should be consulted about issues over long term provision of RRT